CUMBERLAND COUNTY COLLEGE

Course: MA 130 Calculus 1

Credits: 4

Prerequisites
MA 120 or MA 121 or placement by Accuplacer results.

Description
This is a rigorous calculus course, designed to prepare students for further study in the sciences, engineering, and mathematics. Topics include limits, the derivative, differentiation techniques, linearization, optimization methods, Newton's Method, anti-differentiation, Riemann Sums, the definite and indefinite integral, the area under a curve, and a variety of applications for the above. Important theorems include the Fundamental Theorem of Calculus, the Mean Value Theorem, Rolle's Theorem, and the Intermediate Value Theorem.

Learning Outcomes
At the completion of this course, students will be able to:

- Analyze limit values for a variety of functions
- Analyze the rate of change for a variety of functions.
- Model and apply the derivative to solve optimization, physics, and related rate problems.
- Determine a function's antiderivative, and solve applications of initial value problems.
- Use numerical methods to approximate function values, function roots, and areas.
- Evaluate definite and indefinite elementary integrals.

Related General Education Outcomes

- Students will translate quantifiable problems into mathematical terms and solve these problems using mathematical or statistical operations.
- Students will construct graphs and charts, interpret them, and draw appropriate conclusions.

Topical Outline

- Graphing and functions
    - Graphs and their properties
    - Linear models and Rates of Change
    - Functions
    - Definition of a function and ways to represent them
    - Finding the domain and range
    - Notation and operations
- Limits and Continuity
    - Limit of a function
    - Properties of limits
    - Techniques for evaluating

    - One sided and infinite limits
    - Delta, epsilon definition of a limit
    - Continuity
    - Definition of continuity at a point
    - Theorems on continuity
- The Derivative
    - Slope of a curve at a point
    - Definition of the derivative of a function
    - Derivative formulas
    - Derivative of an implicit function
    - Higher order derivatives
    - Inverses
    - Applications of the derivative
    - Logarithmic differentiation
- Curve Sketching
    - Increasing and decreasing functions
    - Relative maxima and minima
    - First derivative test
    - Second derivative test
    - Concavity and points of inflection
    - Rolle's and Mean-value theorem
    - Maxima and Minima applications
- Related rates
    - One-dimensional kinematics
    - The differential and its applications
- Anti-differentiation / definite integral
    - Area under a curve
    - The Fundamental Theorem of Calculus
    - Basic integration techniques & u-substitution
    - Numerical integration
    - Applications of the integral
    - Introduction to Logarithms
    - Definition and properties of natural logarithm
    - Natural Logarithm & Integration
    - Definition and properties of natural exponential

Required Texts and Other Materials

Thomas' Calculus Early Transcendentals, 13th ed: Pearson.

Student Assessment
Assessment may be accomplished through projects, portfolios, online assignments, exams, presentations and/or papers.

Academic Integrity
Plagiarism is cheating. Plagiarism is presenting in written work, in public speaking, and in oral reports the ideas or exact words of someone else without proper documentation. Whether the act of plagiarism is deliberate or accidental [ignorance of the proper rules for handling material is no excuse], plagiarism is, indeed, a "criminal" offense. As such, a plagiarized paper or report automatically receives a grade of **ZERO** and the student may receive a grade of **F** for the semester at the discretion of the instructor.

Available Resources
If you are having difficulty with work in this class, tutoring is available through the Success Center. If you think that you might have a learning disability, contact Project Assist at 856.691.8600, x1282 for information on assistance that can be provided to eligible students.

(List availability of open labs and/or writing center)

Before Withdrawing From This Course
If a student experiences adverse circumstances while enrolled in this course and considers withdrawing, s/he should see an advisor (division or advisement center) BEFORE withdrawing from the class. A withdrawal may cause harmful repercussions to completion rate standards and overall GPA which can limit or eliminate future financial aid in addition to causing academic suspension.